First Use Date: October 19, 2007

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
SUPPLEMENTAL SPECIFICATION

Section 624—Sound Barriers

Delete Section 624 and substitute the following:

624.1 General Description

This work includes furnishing and installing a sound barrier according to this Specification and conforming to the locations, dimensions, lines, and grades shown on the Plans.

Unless a specific type is required by the Contract documents, select one of the following barrier types

Type B	Interlock steel panels
Type C	Precast concrete panels
Type D	Treated timber panels
Type F	Glass reinforced thermoset composite structural panels
Type G	Precast autoclaved aerated concrete (PAAC) panels

624.1.01 Definitions

General Provisions 101 through 150.

624.1.02 Related References

A. Specifications

Section 106—Control of Materials

Section 201—Clearing and Grubbing Right-of-Way

Section 205—Roadway Excavation

Section 206—Borrow Excavation

Section 208—Embankments

Section 210—Grading Complete

Section 500—Concrete Structures

Section 520—Piling

Section 700—Grassing

Section 702—Vine, Shrub, and Tree Planting

Section 865—Manufacturing of Prestressed Concrete Bridge Members

Section 885—Elastomeric Bearing Pads

B. Referenced Documents

GDT 7
GDT 20
GDT 21
GDT 24a
GDT 24b
GDT 59
GDT 67
QPL 42
QPL 53
Federal Specification QQ-S-763-C

AASHTO	ASTM		
M 31/M 31M	A 153/153M	C 1386	D 2092
M 32/M 32M	A 653/653M	D 638	D 2583
M 111/M 111M	A 792/792M	D 695	E 90
M 270/M 270M	B 695	D 790	G 154
	B 766	D 792	

624.1.03 Submittals

Submit Shop Drawings to the Engineer for review and approval.

Prepare Shop Drawings for each Sound Barrier.

Show all details necessary for field erection. The minimum requirements are:

Complete elevation view showing the top and bottom elevations, the required wall envelope, the roadway grade and ground line at the wall.

Diameter and depth of caissons at each post

Post size

Complete plan view with dimensions, stations and offset

Have the manufacturer certify to the Department that a specimen of the proposed barrier meets or exceeds a minimum weighted sound transmission loss of 20 dBA. Furnish test results for barrier material types (except Type C). The transmission or loss results must be based on the generalized truck spectrum when tested according to ASTM E 90.

624.2 Materials

Ensure that other materials not listed herein meet the requirements of the appropriate Specification to which they pertain.

A. Type B

1. Interlocking Steel Panels

Use cold formed configured steel panels that meet these requirements:

- Use steel sheet conforming to ASTM A 653/653M or ASTM A 792/792M Structural Steel (SS) Grade 50 Class 2 with a minimum thickness of 0.029 inches (0.74 mm)
- Provides friction interlocking with adjacent panels
- Has a male-female rib that provides a friction interlock connection with adjacent panels or is joined adequately according to the manufacturer's specifications
- Provides sufficient friction interlock connection strength to support its own weight without using fasteners when connected to another panel and held in a vertical or horizontal position

Use a panel size and shape shown on the Plans or an alternate approved by the Engineer.

Coat (galvanize) the panels with either a G90 (Z275) weight of zinc according to ASTM A 653/653M or an AZ50 (AZM150) weight of 55% aluminum-zinc alloy according to ASTM A 792/792M.

2. Protective Color Coating

   Use one of the following coatings:

   a. System A—The coating is polyvinylidene fluoride (70 percent resin, minimum enamel, PVF2).

      1) Apply the coating system (including primer) at a total minimum film thickness of 1 mil (0.03 mm) per coated side.

      2) Cure the polyvinylidene fluoride film to at least 0.8 mil (0.02 mm) film thickness.

   b. System B—The coating is polyvinyl fluoride plastic film (PVF1) and has a thickness of at least 1.5 mils (0.04 mm) coated on both sides.

      1) Have the coating applied at the factory to thoroughly cleaned and pretreated galvanized steel according to ASTM D 2092, Method F.

      2) Laminate the coating to the galvanized steel using heat and adhesive to form a uniform and durable coating pigmented to obtain optimum color performance.

      3) Use a color from the Federal Standard Color Number indicated on the Plans. Ensure that caulking is color pigmented to match the wall color specified.

3. Post

   Use a post for steel walls with these features:

   - Hot rolled shape conforming to AASHTO M 270/M 270M GR 36/GR 250
   - Hot-dip galvanized by an approved galvanizer as listed on QPL-53 and in accordance with AASHTO M 111/M 111M
   - Coating that weighs at least 2 ounces/ft^2 (610 g/m^2) on all sides
   - Each post requires pre-inspection by the Office of Materials & Research as evidenced by a GDT stamp affixed near one end of each post

4. Steel Flashing and Caps

   Use flashing and caps for steel walls that are the same material and color coating as the panels. Fasten steel flashing and caps with self-tapping screws. Ensure that A-1 screws are Class #410 Stainless Steel and conform to Federal Specification QQ-S-763-C, or are cadmium coated according to ASTM B 766.

5. Fasteners

   Attach panels to posts using a powder-actuated fastening system. Fasteners shall be stainless steel or shall be hot-dip galvanized as per ASTM A 153 Class C or shall have a mechanically deposited zinc coating as per ASTM B 695 Class 50.

B. Type C

Use precast concrete panels that meet these requirements:

Class AA Concrete	Section 500
Reinforcing	AASHTO M 31/M 31M and M 32/M 32M
Piling-Weathering Steel	AASHTO M 270/M 270M, GR 50W/345W
Piling-Galvanized Steel	Section 520 and AASHTO M 111/M 111M
Elastomeric Bearing Pads	Section 885

Use piling, bolts, and fittings that are hot-dip galvanized when the barrier rests on another concrete structure.

C. Type D

Use treated timber panels that meet these requirements:

Type D.1	See Plan Detail D-1
Type D.2	See Plan Detail D-2
Class A Concrete	Section 500
Bolts and Washers	Plan Details
Pile	Plan Details

D. Type F

1. Structural Plank. Use continuous glass fiber reinforced structural planks that meet these requirements:
   - Are constructed of a durable, UV resistant, flame retardant, thermosetting composite material
   - Are resistant to degradation from ozone, hydrocarbons, and freeze/thaw cycling
   - Match the Federal Standard Color Number indicated on the Plans
   - Meet the following minimum mechanical properties:

PROPERTY	MINIMUM VALUE	TEST METHOD
Flexural Modulus	2,200,000 psi (15 200 MPa)	ASTM D 790
Flexural Strength	70,000 psi (480 MPa)	ASTM D 790
Tensile Strength	65,000 psi (450 MPa)	ASTM D 638
Tensile Modulus	4,500,000 psi (31 000 MPa)	ASTM D 638
Elongation	1.5 %	ASTM D 638
Compressive Strength	60,000 psi (410 MPa)	ASTM D 695
Barcol Hardness	50	ASTM D 2583
Specific Gravity	1.86	ASTM D 792

2. Filler. Use either hollow structural planks or planks filled with a recycled tire rubber compound comprised of sorted and graded ground tire rubber (0.25 ± 0.025 inch (6.4 ± 0.6 mm)).
3. Flashing and Caps. Use flashing and caps of the same material and color as the panels.
4. Caulking. Use caulking that is color pigmented to match the wall color specified.
5. Posts. Use posts fabricated from hot rolled shapes conforming to AASHTO M 270/M 270M, GR 36/GR 250, and hot dip galvanized in accordance with AASHTO M 111/M 111M, except coating weight shall be a minimum of 2.0 oz/ft^2 (600 g/m^2) on all sides.
6. Other Materials. Use materials that meet the requirements of the appropriate Section in the Standard Specifications to which they pertain.

E. Type G

1. Precast Autoclaved Aerated Concrete (PAAC) Wall Units. Use PAAC wall units cast from a mixture of Portland cement, fine aggregate, water, gypsum, lime, and an expansion agent. After setting, and before hardening, the PAAC is machine cut to the required size, then steam-cured under pressure in an autoclave. Use PAAC that meets the following physical requirements:
   - Has a minimum average compressive strength of 725 psi (5000 kPa) when three specimens are tested in accordance with ASTM C 1386, with no single specimen having a compressive strength of less than 580 psi (4000 kPa).
   - Has a maximum shrinkage of 0.02% when tested in accordance with ASTM C 1386
   - Has a dry bulk density between 34 lb/ft^3 (544 kg/m^3) and 41 lb/ft^3 (656 kg/m^3)when tested in accordance with ASTM C 1386
2. Reinforcing. Use reinforcing that conforms to AASHTO M 31/M 31M or M 32/M 32M.

3. Galvanized Steel Supports. Use supports that conform to Drawing No. H2 as shown on the Plans.
4. Welds. Use welds conforming to Drawing No. H2.1 as shown on the Plans.
5. Coatings. Use only approved coating systems on all exposed surfaces, including steel supports. Use the same topcoat color on both the PAAC panels and the steel supports. Submit independent laboratory test results for 1500 hours of accelerated weathering in accordance with ASTM G 154. Submit results that show ratings of at least 9 in the following categories: color change, chalking, checking, cracking, blistering, flaking and rusting. Submit a certification stating that the PAAC topcoat is graffiti resistant.

624.3 Construction Requirements

624.3.01 Construction

Perform the following work according to the Specifications:

A. Clearing and Grubbing

When necessary, clear and grub according to Section 201 as applicable.

B. Excavation, Borrow, Embankment

Perform excavation, borrow, and embankment according to Section 205, Section 206, Section 208, or Section 210. The scope and dimensions of the work are shown on the Plans.

C. Grassing

Perform grassing according to Section 700, as specified on the Plans.

D. Vine, Shrub, and Tree Planting

Plant vine, shrub, and trees according to Section 702 as specified on the Plans.

E. Miscellaneous Construction Items

When items are shown on the Plans but are not covered in this Specification, the Plans and Standard Specifications govern the work.

F. Walls

Follow these requirements to construct each type of wall:

1. Type B Wall

   Install steel sound barrier walls according to the manufacturer's recommendations and Plan details.

   Repair cut, scratched, or marred surfaces according to the manufacturer's recommendations.

2. Type C Wall

   When using precast concrete panels:

   c. Cast them in a precast facility approved by the Engineer.

   d. Have the Engineer determine panel acceptability from the compressive strength of cylinders made and cured the same as the panels, and from inspection during manufacture.

      Have the panel manufacturer furnish facilities and assistance to sample and test quickly and satisfactorily.

   e. Cast the panels on a steel surface with steel side forms.

   f. Place concrete in each panel without interruption. Consolidate the concrete using vibrators supplemented by hand tamping and rodding to force the concrete into the corners of the forms to eliminate stone pockets, cleavage planes, and air bubbles.

   g. Give the panels a Type III—Rubbed Finish on the upper surface (as cast) according to Subsection 500.3.05.AB, "Finish Concrete."

   h. Cure the panels as specified in Subsection 500.3.05.Z.1, "General Curing—Supplying Additional Moisture," (wet cure) long enough for the concrete to develop the specified compressive strength.

      1) Ensure that the curing period is at least 72 hours under normal summer temperature conditions. In colder weather extend the curing period, as directed by the Engineer

2) Protect the panels from freezing from the time the concrete is placed until curing is complete.

3) Instead of the wet cure method, steam cure the panels as specified in Subsection 865.2.01.B.2.g.(2) if desired.

i. g. Mark each panel with the date cast and the Inspector's approval stamp.

NOTE: Even with the Inspector's acceptance at the precast yard, panels can still be rejected at the erection point if they are damaged.

h. Erect the panels according to Plan details and dimensions.

Place bearing pads as shown in the Plans, and tighten the restraining bolts.

i. After erection is complete and before Final Acceptance of the Project, clean the sound barrier to remove dirt or stains.

3. Type D Wall

The Plans shall designate the correct type of D wall (Type D.1 or Type D.2.).

a. Type D.1 Wall

Construct this wall of tongue and groove panels placed in a horizontal configuration supported by vertical posts set on concrete piers. Follow the Plan details for information on sizes, timber treatment, and erection.

b. Type D.2 Wall

Construct this wall of double wood panels staggered to provide a 1/2–width overlap. The supports are posts set in a concrete footing. Follow the Plans for full details of materials and erection, sizes and timber treatment.

4. Type F Wall

Install in accordance with manufacturer's recommendations and Plan details. Do not install walls with burns, discolorations, cracks, or other objectionable marks that would adversely affect the performance of the system.

5. Type G Wall

a. Cast the PAAC panels in a precast facility approved by the Engineer.

b. Have the Engineer determine panel acceptability from the compressive strength of cylinders made and cured the same as the panels, and from inspection during manufacture.

Have the panel manufacturer furnish facilities and assistance to sample and test quickly and satisfactorily.

c. Cast the panels on a steel surface with steel side forms.

d. Place concrete in each panel without interruption. Consolidate the concrete using vibrators supplemented by hand tamping and rodding to force the concrete into the corners of the forms to eliminate stone pockets, cleavage planes, and air bubbles.

e. After machine cutting to the required size, cure the PAAC units by high-pressure steam autoclaving so that the units meet the physical requirements of Subsection 624.2.E.1.

f. Mark each panel with the date cast and the Inspector's approval stamp.

NOTE: Even with the Inspector's acceptance at the precast yard, panels can still be rejected at the erection point if they are damaged.

g. Erect the panels according to Plan details and dimensions.

h. After erection is complete and before Final Acceptance of the Project, clean the sound barrier to remove dirt or stains.

i. Use coatings that are approved by the Laboratory.

1) PAAC panels. Apply the coating with a sponge-textured roller in accordance with the manufacturer's recommendations. Cover all exposed galvanized steel surfaces for protection from splattering. Apply the coating at a minimum thickness of 60 dry mils (1.5 mm). Apply the coating only when the ambient temperature is greater than 40 ^{o}F (4 ^{o}C) and rising. Do not apply any coating during rainfall or when rainfall is forecast overnight.

2) Galvanized Steel Supports. Apply a corrosion resistant coating by brush, roller, or airless spray in accordance with the manufacturer's recommendations. Protect the adjacent PAAC surfaces from overspray.

Apply the coating at a minimum thickness of 2 dry mils (0.5 mm). Use a color that matches the PAAC final topcoat color. Apply the coating only when the ambient temperature and relative humidity fall within the limits stated by the manufacturer.

6. All Walls

Before beginning earthwork on the Project, stake the sound barriers in the field and establish the final groundline elevations at the barrier walls.

Furnish these elevations to the supplier who will develop the shop plans, including a complete elevation view of each barrier indicating top and bottom elevations and the roadway grade.

j. Protect the final ground elevations established in the field for the duration of the Project. Do not adjust them without the Engineer's approval.

k. Install sound barriers according to the Plans and Shop Drawings approved by the Engineer.

l. Secure joints and connections to be structurally sound with no visible openings for sound transmission. Ensure that vibration from metal barriers is not a secondary source of sound transmission.

m. Repair marred, chipped, scratched, or spalled barrier areas according to the manufacturer's recommendations and as directed by the Engineer at the Contractor's expense.

n. To substitute welded for fixed-bolt connections or vice versa on metal barriers, meet these conditions:

- Submit load calculations for the specific connection to be modified.
- Use a safety factor of at least 3.0.

o. Place trench backfill for sound barrier construction according to Section 207. Use select material to backfill.

If the Engineer believes the trench is too narrow for compaction, backfill the trench excavation with concrete grout to the Engineer's satisfaction. No additional compensation will be made for the concrete grout.

p. Dispose of excess excavation to the Engineer's satisfaction.

q. Keep right-of-way fence in place that is scheduled to be salvaged until the barrier is constructed, or as long as the Engineer deems practical.

r. After erecting the barrier, leave the disturbed area in a finished condition at the Engineer's direction and plant grass or sod.

s. Payment for establishing grass is described in Subsection 624.4.C, "Grassing."

t. Ensure that the barrier meets these tolerances:

1) Vertical alignment for barriers and posts is:
   - 0.5 in (15 mm) for barrier heights to 10 ft (3 m)
   - 1 in (25 mm) for barrier heights to 20 ft (6 m)
   - 1.5 in (40 mm) for barrier heights to 30 ft (9 m)
2) Horizontal alignment for barriers is close to that shown on roadway Plans.
3) Post spacings are within 0.5 in (15 mm) of their intended location.

u. For sound barriers built on top of earth berms, construct the berms of earthwork fill material and compact to 95% of the maximum density as determined by GDT 7, GDT 24a, GDT 24b or GDT 67, as applicable. Determine in-place density according to GDT 20, GDT 21, or GDT 59, as applicable.

G. Graffiti-Proof Coating

This work includes providing graffiti-proof coating on both faces of concrete and masonry barriers from the ground line to the top of the wall.

6. Materials. Use materials as noted on QPL 42.
7. Delivery and Storage. Ensure that the materials are delivered in manufacturer's original containers with labels intact.

Store the materials out of the weather, in a single location, and as specified by the manufacturer.

8. Job Conditions. Protect the coating from the weather and work conditions as follows:

v. Apply the graffiti-proof coating in weather recommended by the manufacturer.

w. Mask, cover, or otherwise protect finished adjacent surfaces from damage that work in this Section could cause.

x. Protect finished coatings from staining, marring, and damages from other trades.

9. Quality Criteria. Use materials that are products of one manufacturer.

   Use application equipment recommended or approved by the coating manufacturer for use on this Project. Use equipment in good operating condition.

10. Application. Ensure that the moisture content of surfaces to receive coating are within the limits recommended by the coating manufacturer.

    y. Apply coating after applying a Type III finish of concrete, or after thoroughly cleaning the concrete block.

    z. Apply coating at rate of 1 gal per 250 to 300 ft² (1 L per 6 to 7 m²). Apply three coats using a low-pressure spray.

    aa. Begin the coating application at the uppermost surfaces and work down.

    bb. Remove loose particles, dirt, grease, oil, and other foreign materials following application.

624.3.02 Quality Acceptance

The panels are subject to rejection if they fail to meet the requirements specified above. The following defects are also cause for rejection:

- Defects from imperfect mixing and casting
- Honeycombed or open texture
- Exposed reinforcement
- Failure to meet the required 3,500 psi (25 MPa) compressive strength at 28 days.

624.4 Measurement

A. Clearing and Grubbing

Clearing and grubbing will not be measured separately for payment.

B. Excavation, Borrow, and Embankment

Excavation, borrow, and embankment will not be measured for payment unless an earthwork pay item is included in the contract.

The scope and dimensions of the work are as shown on the Plans.

C. Grassing

Grassing is not measured separately for payment unless shown on the Plans as a pay item.

D. Vine, Shrub, and Tree Planting

Vine, shrub, and tree planting shown on the Plans is measured according to Section 702

E. Items Not Covered in This Specification

Items shown on the Plans but not covered in this Specification are measured for payment according to the applicable portions of the Specifications.

F. Walls

1. Type B Wall

   Steel wall is measured in square feet (meters) of wall surface installed before backfilling complete in place according to Subsection 109.01, "Measurement and Quantities." There will be no separate measurement for posts, flashing, caps, concrete post embedment, or other incidental items required for construction.

2. Type C Wall

   Precast concrete sound barriers are measured in square feet (meters) of wall surface before backfilling, including pile flanges, complete in place and accepted.

   There will be no separate measurement for pile, anchor bolts, plates, connections, neoprene bearing pads, connecting bolts, or other components of the Sound Barrier.

3. Type D Wall

   Treated timber walls are measured in square feet (meters) of wall surface installed before backfilling.

   No separate measurement is made for posts, caps, foundations, footings, hardware, timber treatment, pile or cover boards.

4. Type F Wall

Glass reinforced thermoset composite structural panel walls are measured in square feet (meters) of wall surface installed before backfilling complete in place in accordance with Section 109.

There will be no separate measurement for posts, top caps, bottom caps, side caps, flashing, strip seals, mounting brackets and hardware, concrete post embedment, or other incidental items required for construction.

5. Type G Wall

   Precast Autoclaved Aerated Concrete walls are measured in square feet (meters) of wall surface installed before backfilling, complete in place and accepted.

   There will be no separate measurement for steel supports or any other components of the Sound Barrier.

6. All Walls

   Only authorized changes required to adjust plan ground line elevations and other authorized changes will be measured. Payment will be made based on plan quantity unless changes are authorized.

624.5 Payment

A. Clearing and Grubbing

The cost of clearing and grubbing is included in the Lump Sum Clearing and Grubbing Item for the Project. When Clearing and Grubbing is not shown as a separate Pay Item, the cost is included in the overall Contract Price for the work covered in this Specification.

B. Unclassified Excavation, Borrow and Embankment

No separate payment will be made for Excavation, Borrow and Embankment unless shown on the Plans as a separate Pay Item.

C. Grassing

No separate payment will be made for Grassing unless shown on the Plans as a separate pay item.

D. Vine, Shrub, and Tree Planting

When the Plans state that this Item will be paid for, payment will be made under Section 702.

E. Items Not Covered by This Specification

Items shown on the Plans to be paid for but are not covered by this Specification will be paid for according to the applicable portions of the Specifications.

F. Walls

Unless a specific wall type is specified in the Contract, the contractor shall construct one of the following wall types.

1. Type B Wall

   Steel wall will be paid for at the Contract Unit Price bid per square foot (meter). Payment is full compensation for furnishing and installing materials, providing post and post embedment, and providing labor, equipment, and incidentals to complete the Work.

2. Type C Wall

   Precast concrete sound barrier will be paid for at the Contract Unit Price bid per square foot (meter). Payment is full compensation for furnishing materials, including piling and attachments and for erecting the sound barrier, including graffiti-proof coating.

3. Type D Wall

   Treated timber wall will be paid for at the Contract Unit Price bid per square foot (meter). Payment is full compensation for furnishing materials including concrete and steel and for erecting the sound barrier.

4. Type F Wall

   Glass reinforced thermoset panel walls will be paid for at the Contract Unit Price bid per square foot (meter). Payment is full compensation for furnishing and installing materials, including post and post embedment, and for labor, equipment, and incidentals to complete the Work.

5. Type G Wall

Precast autoclaved aerated concrete sound barrier will be paid for at the Contract Unit Price bid per square foot (meter). Payment is full compensation for furnishing materials, including steel supports, and for erecting the sound barrier, including graffiti-proof coating.

Additional wall payment criteria:

Walls will be paid at plan quantity plus or minus any authorized changes, or adjustments due to the ground line elevation varying from plan.

Payment will be made under:

Item No. 624	Sound barrier, type ___,	Per square foot (meter).
Item No. 624	Sound barrier	Per square foot (meter).

624.5.01 Adjustments

General Provisions 101 through 150.